REMARKS

In the Office Action dated December 10, 2009, the Examiner rejects claims 1-19 under 35 U.S.C. §103(a). With this Amendment, Applicant amends claims 1, 7 and 13-19. Following entry of this Amendment, claims 1-19 remain pending. Applicant respectfully requests reconsideration of the Application as amended.

The Examiner rejects claims 1-19 under 35 U.S.C. §103(a) as being unpatentable over Nagaoka et al. (JP 2002-005656) and Suzuki et al (US 6,535,114).

Claim 1 (and claims 2-6 dependent therefrom) recites in part an apparatus for detecting a position of an object in one or more images captured by an image pickup device mounted on a vehicle comprising (a) a memory configured to store a plurality of images captured by the image pickup device, including a first image of an object taken at a first time and a second image of the object captured at a second time; and (b) a controller operatively coupled to the memory and configured to determine from the first image taken at the first time the object position when an image acceleration is zero and a first pitch angle of the vehicle relative to a y-coordinate in a horizontal direction is zero, and to determine from the second image whether a second pitch angle of the vehicle relative to the y-coordinate in the horizontal direction at the second time is zero, and to determine the position of the object in the second image based on the position of the object in the first image if the second pitch angle is not zero.

Claim 7 (and claims 8-12 dependent therefrom) recites in part a vehicle comprising (a) a memory on which is stored the plurality of images captured by the image pickup device, including a first image of the at least one object taken at a first time when a first pitch angle of the vehicle relative to a y-coordinate in a horizontal direction is zero and an image acceleration is zero and a second image of the at least one object captured at a second time; and (b) a controller operatively coupled to the memory and configured to determine a position of the at least one object in the first image and to determine from the first image whether a second pitch angle of the vehicle in the second image at the second time is zero, and to determine a position of the at least one object in the second image based on the position of the at least one object in the first image if the second pitch angle is not zero.

Claim 13 recites in part an apparatus for detecting a position of an object in one or more images captured by an image pickup device in a vehicle, comprising (a) image

judgment means for determining whether an image of the object captured by the image pickup device was captured when a pitch angle of the vehicle relative to a y-coordinate in a horizontal direction was zero and an image acceleration was zero; and (b) object position computing means for determining a position of the object in a first image if the first image was captured when the first pitch angle of the vehicle was not zero, which determination is based on a position in a second image of the same object that was captured when a pitch angle of the vehicle was zero and an image acceleration of the second image was zero.

Claim 14 (and claims 15-19 by their dependency) recites a method for detecting a position of an object in one or more images captured by an image pickup device mounted on a vehicle. The method comprises storing a plurality of images captured by the image pickup device, determining a pitch angle of the vehicle in each of the plurality of images, an image having a first pitch angle of zero being a first image, determining a position of the object in the first image, determining whether a second image of the object captured by the image pickup device was captured when a second pitch angle of the vehicle relative to a y-coordinate in a horizontal direction was zero and determining the position of the object in the second image if the second image was captured when the second pitch angle of the vehicle was not zero, which determination is based on the first image of the same object that was captured when the pitch angle of the vehicle was zero.

Support for the amendments to these claims can be found in at least FIG. 5 and paragraphs [0015]-[0019].

The Examiner does not address claim 13 in the Office Action. As to claims 1, 7 and 14, the Examiner contends that Nagaoka et al. teaches the limitations of these claims except for the controlling of the pitch angle, contended to be taught by Suzuki et al.

Nagaoka et al. fails to disclose any structure or step that determines from an image taken the object position when a pitch angle of the vehicle relative to a y-coordinate in a horizontal direction is zero, which is required by all of the independent claims. Nagoaka et al. does not determine the absolute pitch angle of an image and does not determine if a pitch angle is zero. Nagaoka et al. discloses a pitching-dependent correction process. (See FIG. 4). The present y-coordinate and the preceding y-coordinate are used and are dependent upon the centroid of the object. (¶¶ [0023]-[0026]). The y-coordinate from which to determine pitching angle is not the same horizontal coordinate from image to image in Nagaoka as it is for Applicant.

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second pitch angle of the vehicle relative to the y-coordinate in the horizontal direction in a second image is zero and one that determines the position of the object in the second image based on the position of the object in the first image if the second pitch angle is not zero, which are required by all of the independent claims. As noted above, Nagaoka et al. does not determine a pitch angle of an image from a common y-coordinate, but rather compares coordinates of objects in more than one image. Nagaoka et al. compares the current image to the previous image and calculates differences in pitch. This is a completely different method than those recited in the claims.

Nagaoka et al. fails to disclose at least these elements of the independent claims. Therefore, Suzuki et al. must teach or suggest each of these limitations to cure the deficiencies of Nagaoka et al.

Suzuki et al. similarly fails to disclose any structure or step that determines from an image taken the object position when a pitch angle of the vehicle relative to a y-coordinate in a horizontal direction is zero. Suzuki et al. discloses a three dimensional calculation expressed in terms of optical flow vectors generated assuming planar surface flow. (Col. 8, line 9- col. 9, line 45). Vehicle dynamics (heave, pitch and roll motions) can be modeled as a second order oscillatory motion using a Kalman Filter. (Col. 9, line 46-col. 10, line 67). Suzuki et al. discloses the use of three dimensional imaging and costly Kalman filtering to obtain images.

Suzuki et al. also fails to disclose a structure or step that determines whether a second pitch angle of the vehicle relative to the y-coordinate in the horizontal direction in a second image is zero and one that determines the position of the object in the second image based on the position of the object in the first image if the second pitch angle is not zero. Suzuki et al. details its procedure for obstacle recognition beginning in column 12 at line 50. No where does Suzuki et al. disclose these elements as recited in the claims.

The Examiner states on page 5 of the Office Action that Suzuki et al. clearly teaches that the gradient information is obtained based on the difference between the estimated pitch angle and the detected pitch angle, referring to FIGS. 8A-9B. As noted by the Examiner, neither pitch angle is zero as recited in the claims. Furthermore, Applicant does not claim the use of a detected pitch angle. As shown in FIG. 8A, Suzuki compares the Kalman filter and the pitch rate sensor. Neither of these fulfills the limitations of Applicant's claims.

Applicant submits that the combination of Nagaoka et al. and Suzuki et al.

fails to teach, suggest or render obvious nearly all of the elements of independent claims 1, 7, 13 and 14 and claims 2-6, 8-12 and 15-19 by their dependency. Applicant submit that this renders these claims allowable over the cited art.

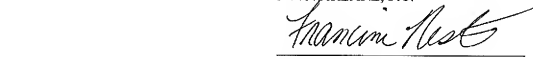
In addition to being allowable based on their dependency from allowable independent claims, claims 2, 3, 15 and 16 are also not taught, suggested or rendered obvious by the combination of references. Claims 2 and 15 recite that the pitch angle is zero if the acceleration is zero. Neither reference discusses acceleration, alone or in determining pitch angle. The Examiner states that claims 2 and 15 are disclosed in Nagaoka et al. at step 41. However, step 41 calculates pitching flow, which is calculated by comparison of a current and a previous image. The acceleration of the object in a single image is not calculated in Nagaoka et al. Claims 3 and 16 recite determining pitch angle from the objects calculated vertical velocity. Neither reference discloses the claim limitation. On page 6 of the Office Action, the Examiner contends that Nagaoka et al. discloses the elements of claims 3 and 16 and cites to paragraphs [0041]-[0048] and equation 7. However, Nagaoka et al. only has thirty five paragraphs and 4 equations. Applicant cannot locate the Examiner's citation.

It is respectfully submitted that this Amendment traverses and overcomes all of the Examiner's rejections to the Application as originally filed. It is further submitted that this Amendment has antecedent basis in the Application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the Application. Reconsideration of the Application as amended is requested. It is respectfully submitted that this Amendment places the Application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited through a conference with Applicant, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

YOUNG BASILE HANLON & MACFARLANE, P.C.



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